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ABSTRACT

This collection of energy lessons is assembled from teacher-written units. The collection is prefaced by background information on the issues associated with current energy problems. Each lesson contains a statement of objectives and a description of the activity. Additional information on variations and materials is provided where appropriate. (RE)

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HARDEE COUNTY ENERGY EDUCATION WORKSHOP

Wauchula, Florida

Winter, 1980

EXEMPLARY ENERGY EDUCATION LESSONS FOR ELEMENTARY SCHOOL STUDENTS, K-6

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A NOTE TO READERS

The following lessons were written by classroom teachers at the Hardee County Energy Education Workshop during the Winter, 1980. The teachers wrote for their classes, selecting what they felt was appropriate for the children and their life situations. They drew upon the many published materials distributed at the workshop - cutting, pasting, writing, and redesigning.

The lessons are offered to other educators not as the best or the most effective lessons, nor as lessons which all other teachers should use in their classes. Rather, the lessons are offered to show what is possible and to inspire others to be creative and to design energy education lessons for their own classes.

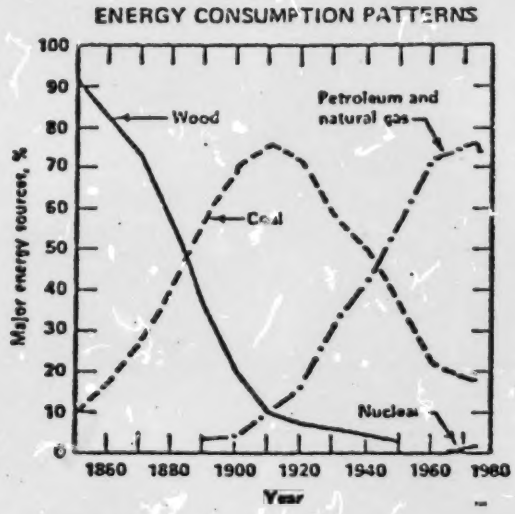
WHY AN ENERGY CRISIS?

During the winter and spring of 1974 most Americans agreed that the Nation faced an unprecendented crisis in energy. But a year later there were no lines at service stations, and gasoline was plentiful at the pump. Many people are asking: Is there really an energy crisis?

The unpleasant truth is that the energy crisis is still with us; it is even worse today. In early 1974, the energy crisis made itself felt in shortages. Today, although shortages continue, the energy crisis is making itself felt less in shortages than in the exorbitant prices Americans are paying for imported oil.

In 1970 the United States paid $3 billion for imported oil; in 1974, $24 billion. But this drain on our national resources is more than a huge net loss of cash and depreciation of currency. It is also a loss of America's business and America's jobs. It means more dollars for foreign bank accounts and fewer dollars for American payrolls. Given a sagging economy and high unemployment, this Nation simply cannot afford to continue to export its wealth at such rates.

The United States is almost 50 percent dependent on foreign oil. Another embargo would be much more effective than the one in 1973-74; our imports are expected to increase 2 million barrels per day if nothing is done. That fact underscores the other major danger of continued dependence on imported oil: our foreign policy and our national security would remain vulnerable to the dictates of a few oil-rich countries. In short, we would give up a substantial measure of our independence as a nation.



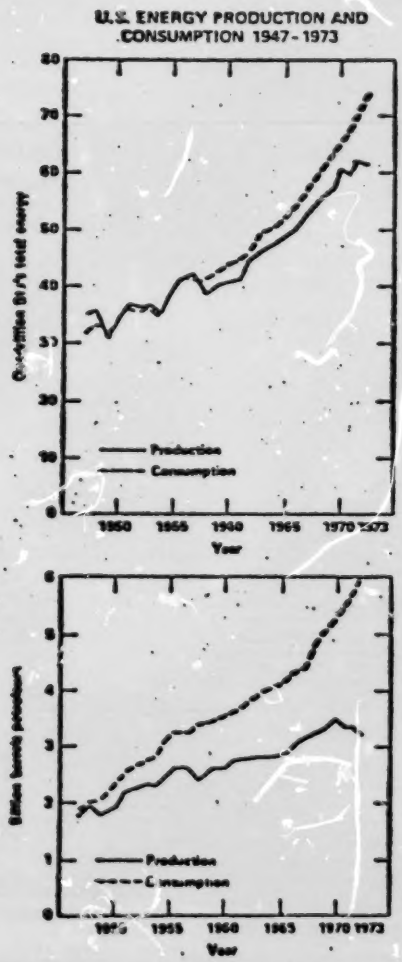
HOW DID THE PROBLEM DEVELOP?

Historically, America has been blessed with an abundance of energy. Most forms of energy, particularly coal and petroleum, have moved freely and competitively in our energy marketplace from producer to consumer.

During the years following World War II, energy sources in the world market became more plentiful and less expensive, competing favorably with our own domestic sources. The discovery of fast and readily accessible oil reserves in the Middle East, plus relatively low per capita consumption in many parts of the world, made oil available and cheap. In fact, during the 1950's and 1960's, the domestic petroleum industry was protected by restrictions on imports. Ample domestic supplies of natural gas, oil, coal, and hydroelectric power made the United States self-sufficient in energy.

Except during World War II the energy industry has exerted strong selling pressure in the country. In essence, the energy market was a buyer's market.

The enterprise and capital of sellers of energy, such as the domestic oil companies, made low-cost petroleum readily available to all the countries of the world. They helped fuel the economic recovery of Europe and Japan after World War II and the development of the new emerging nations. There is no doubt that our own foreign trade was greatly enhanced by that sequence of events.



Gradually, however, our domestic production of energy began to slip. Our coal production peaked in 1947. Domestic exploration for oil and gas began to fall off in 1956. Since 1970 our domestic oil production has been decreasing. And now, natural gas production seems to have topped out. We have not even built enough refineries to keep up with our domestic demand for refined oil products.

At the same time that our domestic supplies of energy have been going down, demand has continued to increase at ever faster rates. The result is that our demand for foreign oil has grown ever faster than our appetite for energy in general. Suddenly, late in 1973, the Arab oil producers imposed an embargo, which reduced our imports by over 1 million barrels a day.

Although the U. S. Government responded by setting up an allocation system to manage the shortage, we experienced serious regional difficulties, and certainly there was general consumer inconvenience. Our gross national product was reduced by about $10-$20 billion as a result of the embargo. The embargo was so sudden that there was little opportunity to prepare for it by converting to other fuels. For example, only about 20 electric utilities were able to convert from oil to coal.

When the embargo was finally lifted, we were suddenly faced with a new and perhaps more frightening energy crisis; the oil-exporting nations raised the price of oil in the world market from about $3 per barrel to $11 per barrel with constant increases since 1974. This move has had a much more insidious impact on the United States and the rest of the consuming world than the embargo itself.

The energy crisis has, therefore, become an economic crisis because of the skyrocketing price of oil and the intolerable drain on our wealth. It is also a political problem because people are angry and frustrated by what has happened to their pocketbooks. And finally, it is a national security problem because the United States remains dependent on a limited and unstable sector of the world for so large a portion of its petroleum needs.

HOW CAN WE SOLVE THESE PROBLEMS?

For the American people there can be only one solution. We must strive for energy independence. In both the short-and long-term, that means conservation. It simply is not possible within the next several years to expand our domestic production of energy to meet current demand growth rate. The only immediate alternative is to reduce consumption of energy--to use less oil, less natural gas, less electricity.

At the same time we must move forward in developing our abundant domestic energy resources in ways that do not injure our environment. And for the even longer term, over the last quarter of the century, we must develop altogether new resources, such as solar, geothermal, and nuclear fusion energy.

This two-pronged attack on the energy crisis--improved energy conservation and increased energy production--must become part of our way of life. The effort will require a commitment from all Americans--business, labor, and consumers--so that we may restore and maintain our prosperity and our energy independence.

ENERGY KNOWLEDGE

The following statements of energy knowledge were developed in North Carolina and seem to reflect critical understandings for today's children who will live in a new ENERGY REALITY.

1. Energy is required for change--biological/physical.
2. Matter and energy, under normal conditions, are neither created nor destroyed, but can be converted from one form to another.
3. When energy is transformed from one form to another, the amount of useful energy is reduced.
4. The sun is the primary source of energy for the earth.

5. All sources of energy are limited in some way (availability, practicality, application) and, therefore, pose unique utilization problems.

6. Presently, most energy requirements are met through using fossil fuels (coal, oil, and natural gas) which are finite and not renewable on any human time scale.

7. Alternatives (e.g., solar (wind, hydro, biomass), tidal, fission, fusion, and geothermal) to fossil fuels are available for development to meet long-term energy needs.

8. The use of energy is necessary for the operation and survival of any society.

9. The development, distribution, conversion, and use of energy result in environmental, political, economic, and social consequences.

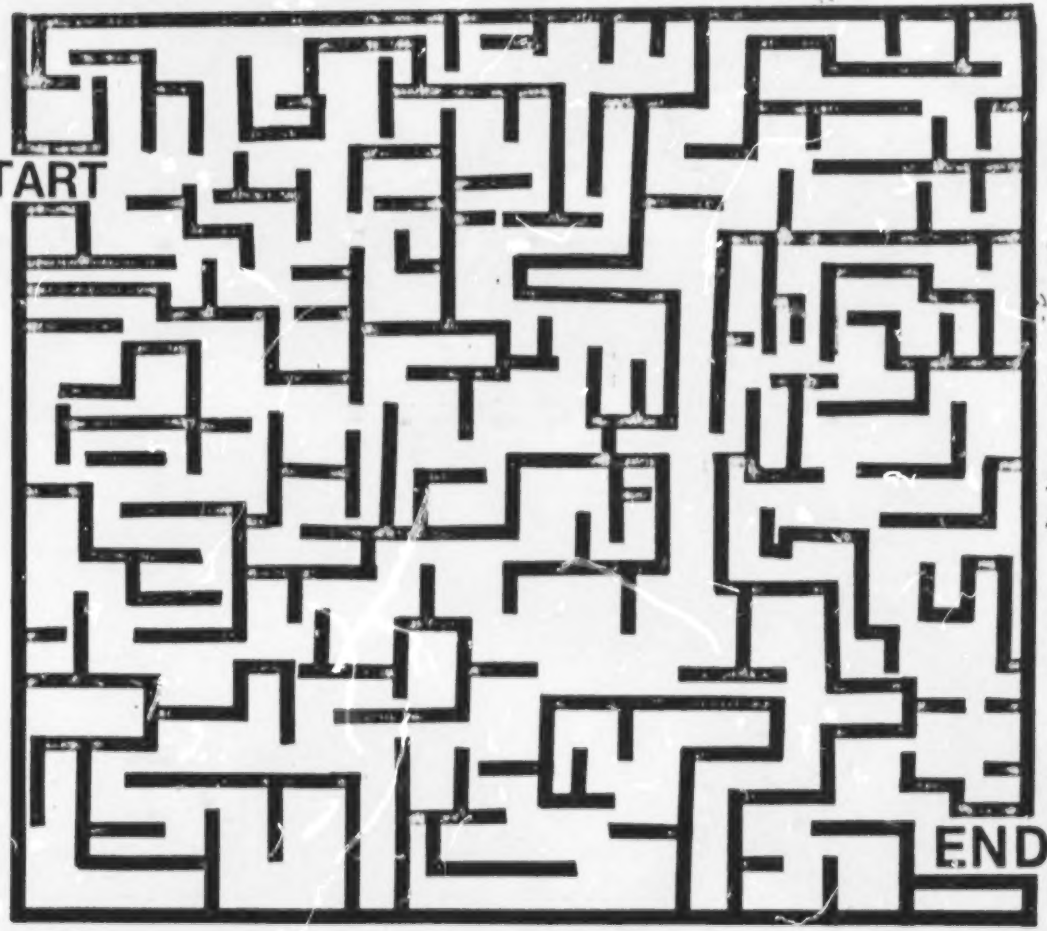
10. Energy conservation will extend the availability of energy resources.

11. The needs, attitudes, and values of the individual and society affect the use of energy.

ENERGY ACTIVITIES FOR STUDENTS IN GRADES K TO TWO.....

Help Energy Ant

Find a way through the maze to turn off the light.



BIG QUESTION: WHY DOES ENERGY ANT WANT TO TURN OFF THE LIGHT BULB ??????????

WHY IS IT A GOOD IDEA TO TURN OFF UNUSED LIGHTS ??????????????

OBJECTIVE: To understand that clothing is an "insulation" to conserve the body's heat.

ACTIVITY: Ask the students what they do on a cold day to keep their bodies warm. What do they do on a hot day to cool their bodies?

Ask what the clothes in the following picture can do for someone outside on a cold....and what they would do to someone outside on a very warm day?

Ask them to conclude: 1) how we can use clothing to keep cool in the summer without excessive air conditioning? 2) what we can do in the cool winter to avoid paying to run the home heater?

OBJECTIVE: To understand how electric is used in schools, that it costs money, and that electricity (and money) may be saved.

ACTIVITY: Invite the school custodian to come into the classroom and ask him to explain how electricity helps him to do his work in the school. Ask him to explain how his work would be different if he didn't have "electric helpers." Ask him to specify the main uses of electricity in the building. What plans have been made to save electricity?

Finally ask the custodian to plan with the children as to how they can save electricity or other energy in their particular classroom. Suggest to him that they would like to have him visit their classroom every week for a few minutes to tell them how their classroom and the school is doing in its efforts to save electricity and other forms of energy.

OBJECTIVE: To understand that heat energy can make things move!

ACTIVITY: Take a pencil and tape a light plastic/cellophane square to it (making a flag-like instrument). As students observe, hold it over an incandescent bulb. As the bulb gets hot, warm air currents rising will make the "flag" wave!

Students might cut paper and make a pinwheel (using a straight pin to affix it to a pencil eraser). They might hold it over the bulb, to see if the heat (warm air rising) will turn the pinwheel. Ask them to explain what they saw.

OBJECTIVE: The student will be able to see that energy can be consumed faster than it can be produced.

ACTIVITY: The children will plant a tree seed and wait for it to grow. A time limit can be set for the observation. While this is being done, take a piece of paper and burn it or use it in some way. The children will see that it can be used much faster than it will take the tree to even begin to grow.

OBJECTIVE: The child will see that the sun can be used to save electrical energy.

ACTIVITY: Each child will be given two wet pieces of cloth. Have them put one of them in the electric dryer and place or hang the other one in the sun. Let the children observe the electric meter when the dryer is not in use and then let them watch the meter when the dryer is turned on and in use. Show that even though drying in the sun may take longer it is saving electrical energy and money.

OBJECTIVE: The student will discover that wind can be used as an energy source.

ACTIVITY: Each child can make a little sailboat; using cork, toothpick and a triangle of paper. Put their "boats" in the tub of water when there is no wind blowing and show that their "boats" won't go from one side to another. Now let them blow and show that their wind can cause their boat to travel a distance.

OBJECTIVE: The student will observe and record on a chart with their teacher's help the process of leaves being returned to the earth.

ACTIVITY: A simple activity for this is for the children to gather leaves and sticks and place them in a box or container to be put outside and exposed to the weather. This could be a long process in terms of weeks but will show that it is nowhere near as long as the millions of years it took to form the petroleum and coal sources in our earth.

OBJECTIVE: The children will demonstrate wind can move an object to another place.

ACTIVITY: Each child will blow up a balloon and then let them go. Talk and discuss what was inside the balloon that made it travel to the other side of the room.

OBJECTIVE: The student will demonstrate on a small scale how falling water has a force.

ACTIVITY: The students will construct a wall made of popsicle sticks to be used as the dam wall. Fill up one side of the tub with water and then let the children observe the force of the water as it falls. You could place an object under the water to show how the force keeps the object down. (You can explain that if this force was used to turn a generator, you could produce electricity.) After this is completed, remove the dam from the water and let the children see that the force of the water comes from the fall. They will see the water force is gone.

OBJECTIVE: To discover that energy is all around us.

ACTIVITY: Take a trip around the building. Have the children look for energy users -- things that produce motion, heat, or light energy.

Make a list of all the energy users on the board. Discuss the type of energy each uses.

ACTIVITY: Ask the children to draw things at their home that use energy.

OBJECTIVE: To help children understand the meaning of conserve or conservation of energy. (to use wisely)

ACTIVITY: Give each child a lollipop. Talk about what would happen if you took a bite and ate it. If you continued to take bites pretty soon your lollipop would be gone. How could you get it to last longer? (lick)

Now pretend that this lollipop is really something else -- something that would be gone forever. How would you treat it? What would you do to make it last as long as possible?

OBJECTIVE: To discover that the sun is a source of energy.

ACTIVITY: Take two quart jars; paint one jar black.
Fill each jar with water and put on air tight lid.

Put jars in sunlight for two hours. Children feel jars. Decide which one is warmer. Measure the difference in temperature of water in both jars. Which one got hotter? Why?

OBJECTIVE: To understand that the sun is necessary for plant growth.

ACTIVITY: Use two plants of similar size -- place one in the sun and place the other one in the closet.

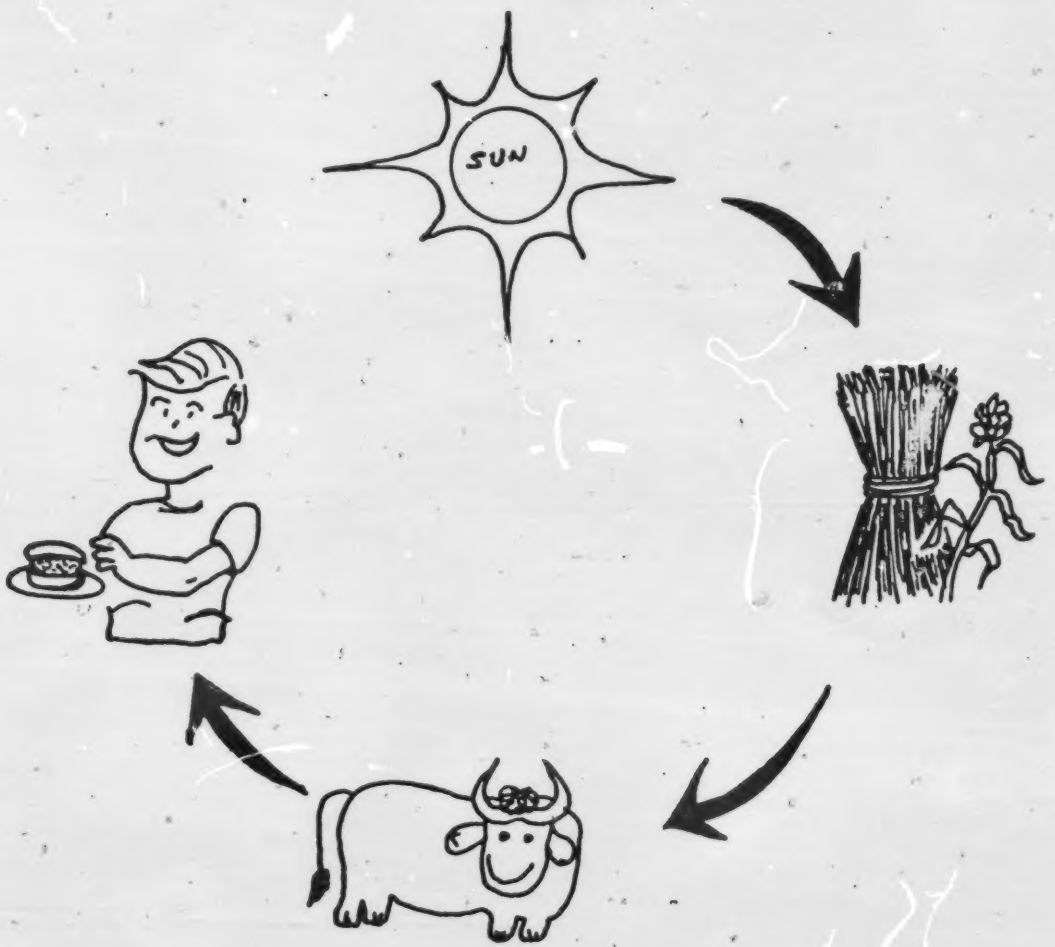
Check both plants every day and record observation.

After one week discuss what has happened to both plants. How are they different? What made the difference.

OBJECTIVE: To understand that the sun's energy provides energy to our muscles through the food chain.

ACTIVITY: Examine the diagram below with children. Ask them what is happening, from sun to boy who is eating. Ask them what plants do with the sun's energy. What happens when people eat those plants -- or when they eat animals who have eaten those plants.

Energy is passed through the food chain, from the sun.....to.....



OBJECTIVE: To help children understand that fossil fuels are non-renewable.

ACTIVITY: Explain how fossils came to be. Use pictures of shells, etc., and pictures of fossil remains. Examine samples of oil and coal. Once used it is gone forever -- there is not anyway to get it back.

Example: Give each child a cookie. Examine it and then have them eat the cookie. It is gone -- gone forever. In a similar way, we are using up our supply of coal, oil, and natural gas.

OBJECTIVE: To discover how dependent we are on energy.

ACTIVITY: For one day do not use things at school that use energy. Plan to have bag lunches, prepared without the use of energy; other than people energy.

Discuss the kinds of activities that were possible and impossible. Do you like school better with or without energy? Are there some things we could do without?

OBJECTIVE: To discover ways to save energy.

ACTIVITY: After activity on things that use energy discuss things that could be turned off when they are not needed; things that could be adjusted to save energy; and things that we could do without.

Examples:
a) Lights
b) Close doors - when air or heat is on
c) Adjust thermostats
d) Electric clocks
e) Bells
f) Drive cars only if necessary
   car pools
   plan trips
g) Conserve paper - use both sides
h) Etc.

OBJECTIVE: To understand that different colors absorb different amounts of solar energy, as do different materials.

ACTIVITIES: 1. Take two boxes of equal size and place a thermometer in bottom of each one. Cover one with a white paper and one with a black paper. Place in sunlight and after 30 minutes compare reading.

2. Take four cups, one yellow, one red, one green and one black. Put a thermometer and H_2O in each cup. Place in sunlight - after 30 minutes compare reading.

3. Take a piece of tar paper and one piece of aluminum foil and one piece of plain card board of equal size. Place a thermometer under each piece. Place in sunlight. After 30 minutes obtain and compare readings.

4. Take four pieces of construction paper; one red, one blue, one black and one yellow. Place one ice cube on each sheet in the sunlight. Observe the melting time of each.

OBJECTIVE: People can collect the sun's energy and use it to do work for them.

ACTIVITY: Students can use a pan or bottle for this exercise. Each student group will need two identical containers and two thermometers. Since most of the students cannot read a thermometer, they can use uncalibrated ones, and, using a grease pencil, mark the intial and final readings. Interpretation can be based upon a change or rise in the column.

Students will put one container in sunlight and another, filled with the same quantity of water, in the shade. Initial temperature readings should be taken. (The teacher may want to make an actual degree reading.) After one hour students should check their containers and make a final temperature reading.

Discuss with the students what has happened. Has there been a change in the water temperature? How can you tell? Has the temperature increased, decreased, or stayed the same?

Did the sunlight have any effect on the water temperature? Did the shade have any effect on the water temperature?

Optional: Students can paint their containers with non-water-soluble flat black paint and repeat the exercise. Did the black paint have any effect on the water temperature?

Discuss the use of solar energy to heat homes.

OBJECTIVE: To understand that different colors absorb different amounts of solar energy, as do different materials.

ACTIVITY: On the same outdoor surface place several thermometers. Cover each from the sunshine with construction paper (of the same thickness, but different in color). Have students read the temperature every hour for several hours. Record the differences. Then, the next day, cover one thermometer with black paper and another with aluminum foil, shiny side up. Record the temperatures each hours for several hours. What conclusions can you draw with the children? What color shirt should you wear out-of-doors on a hot, sun shiny day?

As a treat, make some SOLAR TEA. Put water and tea bags in a glass gallon jug. Put outside in the sunshine until the desired tea strength appears. Then, enjoy!

OBJECTIVE: To understand that the sun transfers energy to heat H_2O.

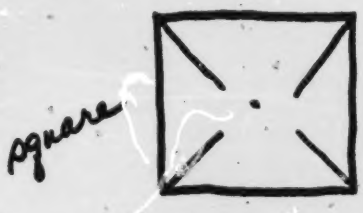
ACTIVITY: Obtain two jars of equal capacity and fill with H_2O. Place one container in a dark room at room temperature. Place the other jar in direct sunlight and observe by feeling. Upper groups of 1st and 2nd grades may use a thermometer.

WIND ENERGY

OBJECTIVE: To discover the relationship between moving air and energy (that moving air has energy).

ACTIVITIES: 1. On a windy day, take class outside to watch leaves or flag blow.

2. Make paper pinwheels and have children blow or take outside and let wind blow.



3. Place burning candle in a glass and apply a cover. When O_2 is consumed, observe what happens. Why?

4. Blow colored H_2O through straw to show that wind pressure blows H_2O out.

5. Paint a concrete sidewalk with H_2O. One in the shade and one in sunlight. Observe the drying time.

OBJECTIVE: To understand that energy is needed to do work. Energy is so basic that nothing moves or is accomplished without it.

ACTIVITY: Review with children the idea that <u>work</u> in the scientific sense is generally related to motion. Objects at rest tend to remain at rest unless force (energy) is applied to move them. Energy is often defined as the ability to do work.

Engage children in the class in lifting or pushing several of the objects in the classroom such as books, erasers, chalk, chairs, objects on the window ledges, and so forth. Help children understand that in all of these lifting and pushing activities work was being done and the energy was provided by their muscles and thus from the food they eat.

As a homework assignment ask each child to bring in pictures from magazines that show work being done by machines or people in daily life. Analyze the pictures as a class and group them according to the energy source that is responsible for the motion (or work) being done. Organize the pictures into a wall or bulletin board display. What sources of energy seem to be most prominent in our society?

OBJECTIVE: To understand that saving energy which people have to buy means saving money, and that using the sun's energy will help us save money.

ACTIVITY: On a day of low humidity, hang wet clothes on a line in the sun, outside the classroom windows. Have children observe what happens each half hour. Discuss their observations, related to the work performed by the sun -- the evaporation of the water, or the drying of the clothes.

Homework: Discuss with parents the cost of drying clothes at home by clotheslines and by electric dryers.

OBJECTIVE: To discover that energy is wasted at school.

ACTIVITIES: 1. Use a strip of paper around pencil and hold along window edge to see of air is coming in.

2. Put a thermometer near window crack where paper waves and where it didn't and see if temperature goes up or down.

3. Place a thermometer near door and in center of room. Check to see which is colder.

OBJECTIVE: To discover the relationship between energy use and energy loss -- usually with heat.

ACTIVITY: Burn a piece of charcoal in an aluminum pan to show that once it is used it is gone. (Use what is needed.) The coal was developed years ago but in a short while it is eliminated.

OBJECTIVE: To understand that the human body in motion creates heat and energy.

ACTIVITIES: 1. Have student rub hands together. Do you feel the heat? Is heat energy? Does heat do work?

2. Run a lap around school yard. Feel face before and after run.

OBJECTIVE: To discover the relationship between food energy and growth.

ACTIVITY: Obtain two small white mice and place in separate cages. Students may want to name and label the cages. Over a 30 day period, control feed the mice. Give one mouse proper diet and the other improper diet.

OBJECTIVE: To discover that energy can be saved by people....that each individual can help to conserve energy.

ACTIVITIES: 1. Have students name while teacher lists on board ways that they dan do to help save energy.

2. Provide magazines for children to cut out pictures of ways to save energy.

3. Have students make a scrapbook of pictures (cut-outs) from magazines.

4. Make children aware of turning out lights, closing windows and doors. Turn off all electrical appliances. Wear warm clothing inside rather than burning the heat.

5. Make paper dolls and dress according to weather.

ENERGY ACTIVITIES FOR
STUDENTS IN GRADES THREE
AND FOUR.....

OBJECTIVE: The student will stop energy waste in the school and classroom.

ACTIVITY: A child is chosen (daily or weekly) to turn out the classroom lights and turn off the heater when the class leaves the room. The child can graph the time the lights and heat are "ON" and "OFF." Compare these times and draw your own conclusions: Which shows more energy being conserved = lights "OFF" for "X" number of minutes versus lights "ON" for "X" number of minutes.

OBJECTIVE: Words and their meanings in relationship to energy. The children will be able to locate the word on a bingo card.

MATERIALS: Blank bingo cards, markers, energy vocabulary list.

ACTIVITY: Give children the vocabulary list and have them put the words at random on the cards. Call the boards and have children mark them as you call them.

I found it works best to have a list of words and mark the letter for the word as you call it.

EXAMPLE: Watts
Power
Energy
Gasoline
Electric
Steam

OBJECTIVE: Ways energy is wasted. The student will be able to locate and identify sources of energy waste in the school, home, etc.

MATERIALS: Checklist, pencils, draft measurement tool, thermometer.

ACTIVITY: The children go on a "scavenger hunt" for sources of energy waste in the school (home, etc.) They take with them a checklist as a guide for things to look for. After bringing back lists, this activity can be expanded into ways to correct these areas of waste.

Some of the things found by my students were:

1. Hall doors left open.
2. Hand dryers (electric) running with no one using them.
3. Windows open with heater or air conditioner on.

OBJECTIVE: Nature provides natural cooling. The children will be able to observe the differences in temperature in a natural setting and a man made setting.

MATERIALS: 4 outdoor thermometers, 1 parking lot (asphalt), 1 natural area with trees, 1 open field (no trees), 1 large concrete area, paper for recording temperatures, chart paper for graphing.

ACTIVITY: Place the thermometers in the four areas. Record the temperatures at early morning, noon and right before school is out. After a week of recording temperatures, graph the temperatures and show how the different areas varied. Discuss how and what might be causes of the differences.

Some points to bring out would be natures way of cooling and what man has done to this.

OBJECTIVE: To understand that human beings' use of energy has changed over time.

ACTIVITY: During a study of pioneer life attention will be given to how food, clothing, and shelter were provided at that time. It should be pointed out to children that the energy sources used to do most of the work in the pioneer family unit were (1) human muscle, (2) animal power, and (3) wood.

Divide the class into three groups: food, clothing, and shelter. Ask each group to research through reading and interviews how their basic necessity was produced in pioneer times before electricity was available. Ask each group, also, to research how electricity is used today to produce the food, or clothing, or shelter we use so freely.

Ask each group to summarize its findings to the class and indicate what changes we would need to make in the way we live if we had no electricity.

OBJECTIVE: To understand that energy is needed to maintain the style of life we have learned to expect.

ACTIVITY: Arrange to have a pizza party as a clasroom activity. If possible, involve parents or the school lunchroom program personnel to make the party a no-cost or very low cost activity for the pupils. Ask the persons preparing the pizza to use a great variety of ingredients: tomatoes, flour, cheese, anchovies, meat, pepperoni, etc. During the party, engage the children in identifying the ingredients they see or taste and list them on the chalkboard.

For each ingredient ask that two or three children research that food and report to the class on some of the energy required to make that food available for their pizza. Energy from the sun for plant growth, energy to cultivate and harvest food crops, energy to can the foods, and energy to transport the foods are examples of the energy involved that can be learned from reference sources or interviews with adults.

After the individuals or groups have reported to the class, engage the entire class in considering the extent to which our food tastes and habits have resulted in heavy energy usage. How might a very serious energy shortage change our eating habits?

OBJECTIVE: Humankind has used many forms of energy through the years. Through creative dramatics the children will experience what forms of energy were used at various times in history. Prehistoric, (wood), Civil War (wood, water, whale oil), World War I (wood, coal, oil), Present Day (oil, coal), Future (?).

MATERIALS: Filmstrips, books, pictures, bulletin board display, records.

ACTIVITY: After the children have been exposed to the various societies, they will then break up into groups and choose one of the societies to dramatize.

Each society must make certain decisions about:

1. What kind of housing?
2. Where will food come from ?
   a. Who will collect it?
3. What kind of clothing?
   a. Who will make it?
   b. What materials will be used?
   c. Any equipment?
4. What kind of transportation?

CONCLUSION: Present a dramatized life scene from the society they chose.

OBJECTIVE: One community's needs differ from that of another community. Given a rural community and a large city, the child will be able to identify the differences that each community has and how each one meets its requirements (oil, gas, coal, nuclear).

MATERIAL: Pictures, filmstrips, books, records, paper, pencil, crayons.

ACTIVITY: Divide the children into two groups. One willdraw a mural of a farm (rural community). The other group will make a mural of a big city. Include as many of the various aspects, e.g., CITY-cable car, buses, elevators; RURAL-tractors, trucks, packing plants, harvesters, plows.

CONCLUSION: Each group will then present their mural relating to the other; the needs and how they are met by that community (oil, gas, coal, nuclear).

EXTENDED: How could these needs be met by more energy efficient means? What means could be used to cut the energy use in each community?

OBJECTIVE: How insulation conserves heat. (What)

MATERIALS: Various types of insulation material such as paper, corrugated board, cloth, and styrofoam should be available for the students to use.

One ice cube per student or pair of students.

ACTIVITY: Have the students plan how they might keep their ice cube from melting longer than anyone else. (So what) Give them time to plan. Let them carry out *their* suggestions. *Do not* tell them to use the insulation materials, but permit them if they ask. At the end of the activity, have those that were most successful share with the others how they kept the ice from melting and *why* they protected the ice the way the did. (For what)

To explore the social consequences of this phenomena, ask students to relate what they learned to decisions when buying the following items. "What would you think about when you and your parents are buying:

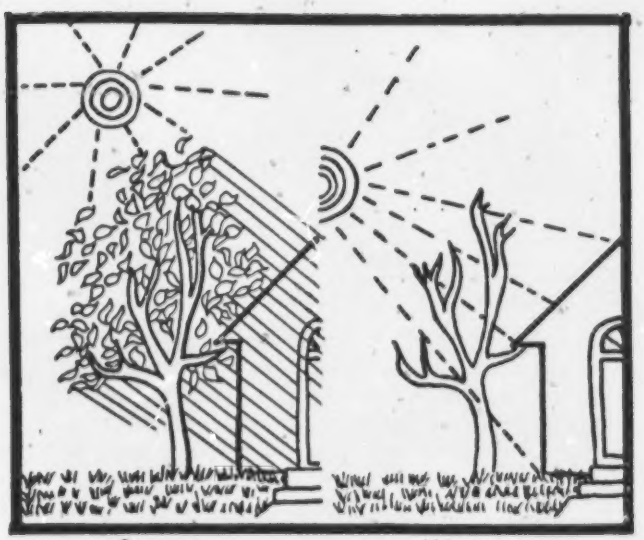
---a container to take coffee to a ball game?"
---an ice chest to go camping or fishing?"
---an oven for your kitchen?"
---a freezer or refrigerator for your home?" (Now what)

OBJECTIVE: To understand that a leafy tree shades radiant heat from the sun in the summer and allows such heat to warm a house in winter.

ACTIVITY: When the sun shines on a house in summer, what happens to the temperature on that side of the house? Inside the house? Examine the diagram below. How does the tree save energy, or make the house cooler in summer?

How might the tree help to warm the house in winter?

If you were going to plant trees in your yard, where would you plant them? What kinds of trees would you plant? Why?



Summer Winter

OBJECTIVE: To understand that hot water use costs energy, and that energy costs may be "saved" by using less hot water.

ACTIVITY: By now, students have heard the energy-saving hint that asks the public to take showers and not baths. In this experiment, students can see for themselves that more energy is used in bathing. Students can do this activity as a homework assignment and share the results in class.

Have students record data while they take a bath. Fill the bathtub as usual (preferred height and temperature). Before bathing, measure the depth of the water in inches.

When it's time to bathe again, take a shower. Before you begin the shower, close the bathtub drain so that your shower water will collect in the tub. After taking your shower, measure the depth of water collected in the tub. Compare this depth with your bath water depth. Which used less hot water? By how much?

Generally, it takes an ounce of oil or a cubic foot of gas, or 1/4-kilowatt-hour of electricity to heat a gallon of water. Ask students to determine how much oil, gas, or electricity it took to heat their bath and shower water.

OBJECTIVE: To distinguish between needs and wants, necessities and luxuries, in figuring the "costs" of energy conservation.

ACTIVITY: Have students bring to class pictures of their home and family, as well as catalogs and magazines. The students will go through the catalogs and magazines cutting out pictures of things that need electricity and putting these pictures into two groups: those that their family needs and those "extras" that they want.

Discuss with the students the idea of necessities (needs) and luxuries (wants). After they have classified their pictures, have the students choose ten electrical items that they feel are necessary to maintain their life style. (Those they can't do without.) Have the students make a collage or mobile of the ten necessities.

OBJECTIVE: To let students clarify if they are willing to give up high energy-use applicances and behaviors in order to conserve energy.

List 13 of your favorite items in your home which require electricity to operate.

If there were a decree which said all families must use <u>less</u> electricity, which three items could you really do without? Draw a line through the three.

Circle the three which really mean the most to you and which you would hold onto until the very end.

Look back over your list and your decisions and consider -

1. Why did you decide to do without the three items?
2. Why did you want to keep the other three?

Looking back at the three items you wanted to keep, HOW WOULD YOUR WAY OF LIVING CHANGE IF YOU HAD TO GIVE UP USING THEM?

Because none of us really want to give up what we have, we need to be aware of how we can use the energy we have most wisely, avoiding waste and unnecessary use. That's what energy conservation is all about; helping people to use their energy wisely.

OBJECTIVE: Energy can be moved from one place to another. To give children the opportunity to discover the relationship between the place where energy is found and where it is used.

ACTIVITY: Have you ever sat on a seat in a closed car? After it sat in the sun? How did the seat feel? (hot) Why did the seat feel hot? (Sun beating down during the day heated car.) Group the children into three groups of nine. Give each child a pan with an ice cube in it. Have children watch and then ask, "What is happening to the ice cube?" (it is melting) Ask, "Why is the ice cube melting?" (getting heat from the room (air) and the dish)

Developing the lesson: We have talked about two examples of heat being passed from one object to another. What are other examples?

1. Food from plants and animals to our bodies (one living thing to another).
2. Heat from toaster to toast bread, from iron to iron clothes (one object to another).
3. Heat from heater or cool air from air conditioner or heat from stove or fire (one place to another).

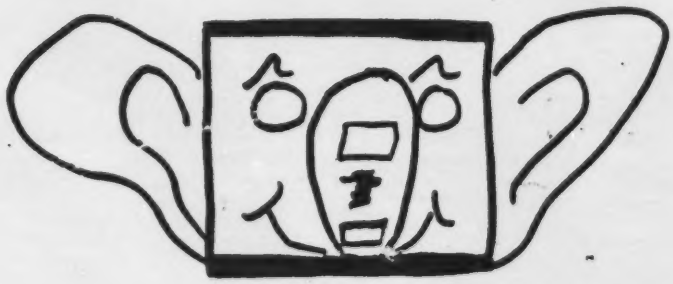
After discussion the children would be taken outside and each would be given an ice cube. A box of aluminum foil, wool, plastic, etc., would be put in a box for them to use if they wanted. I would tell the children to use anything they wanted to prolong the melting of the ice cube. After all the ice cubes had melted we would get in a group to discuss what we had tried. Then we would talk about what we were actually doing to keep the ice cube from melting (insulating it).

I like this activity because after an experiment like this, I could tie it into another area; that being a lesson on the three states of ice. They have seen ice going from a solid to a liquid by this activity. We would just have to discover the other two states.

ACTIVITY: "Edgar Elephant" This could be used as a culminating activity or as a center that the children could go to at leisure to familiarize themselves with energy terms before a concept is introduced.

At the end of this activity children should be more familiar with energy words and their definitions. Their vocabularies should have been increased.

MATERIALS: A square, cardboard box would be needed. The box should have a top and a bottom. An elephant should be painted on the box such as this:



The ears could be made out of cardboard and inserted and glued in the side. The face could be painted on or drawn on with magic markers. The nose should have two rectangular holes cut. Inside the box you need to tape or glue a piece of stiff paper so that when you insert a card with a word in the top of the box, the paper reverses it so that when it comes out of the bottom of the box, the back with the definition or answer is on the top. They could just keep feeding these cards over and over until they are getting more answers correct than incorrect. If you ever test the childrer on the words, you could cover the back of the cards and have them take paper and write the answers to each word inserted. After they had gone through the words you wanted them to know, they could remove the paper off the backs and check their answers.

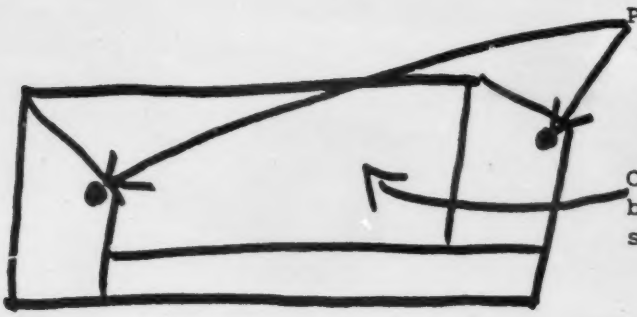
The cards that are inserted could be in the shape of peanuts.

The vocabulary word would be on the front and the definition would be on the back side. The peanuts could be made from brown construction paper and laminated. Words could be added with each new concept studied. This center's list of words should always be growing.

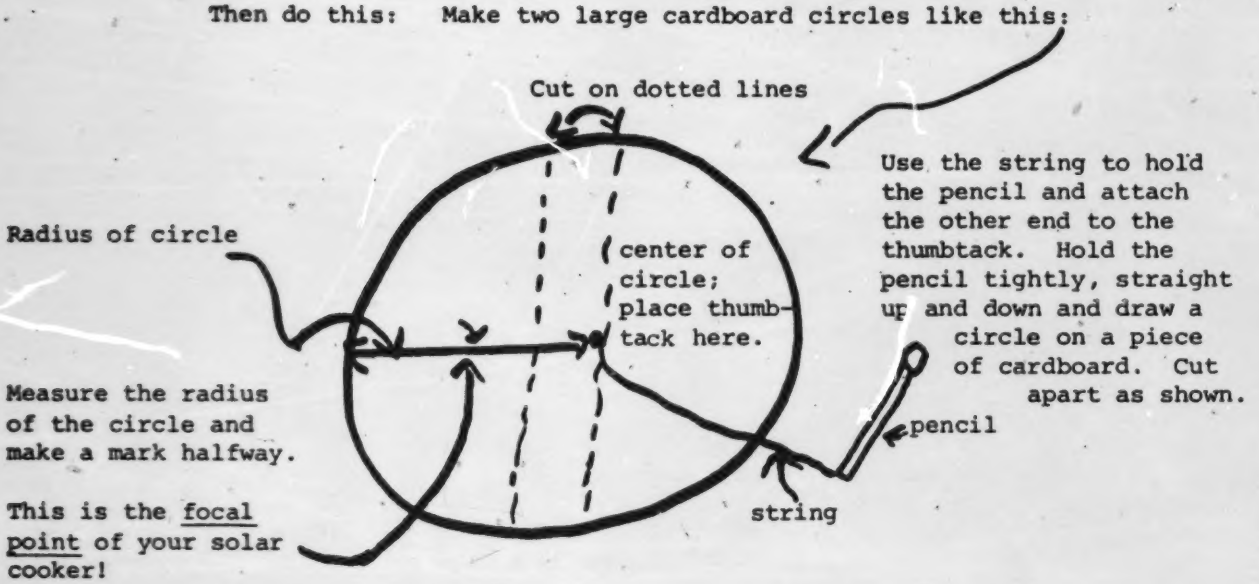
OBJECTIVE: The student will build or use a solar cooker to heat food for an energy-saving meal.

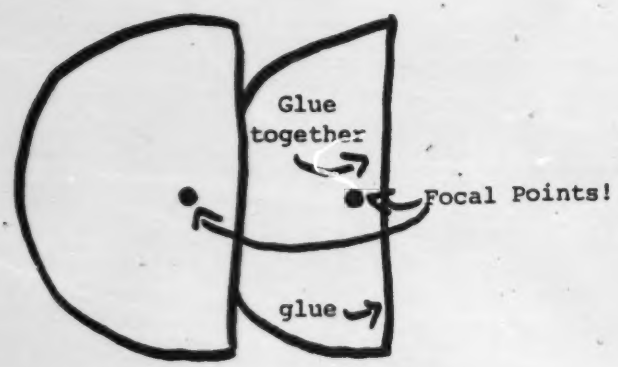
MATERIALS: Solar type cooker (may be purchased from a catalog (Edmunds Scientific) or use some cardboard boxes plus a coat hanger, thumbtacks, string, pencil, two small nuts and bolts, rubber cement.

ACTIVITY: Build a solar unit using boxes



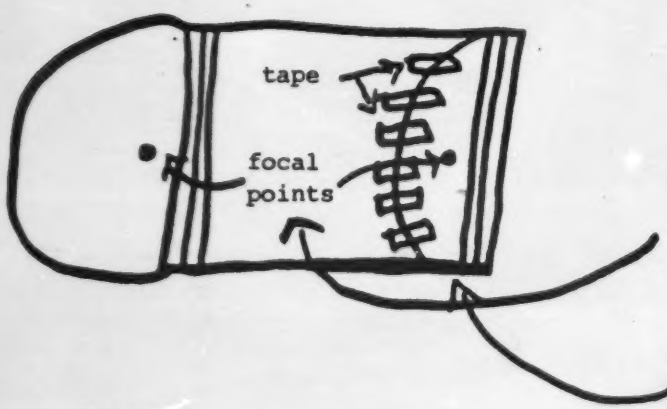
Then do this: Make two large cardboard circles like this:


Cut on dotted lines
Use the string to hold the pencil and attach the other end to the thumbtack. Hold the pencil tightly, straight up and down and draw a circle on a piece of cardboard. Cut apart as shown.
Radius of circle
center of circle; place thumbtack here.
Measure the radius of the circle and make a mark halfway.
This is the focal point of your solar cooker!
pencil
string



Now, glue two pieces together to make one that's twice as heavy! Do this with both circles you cut.

Now, put the two curved pieces together like this:

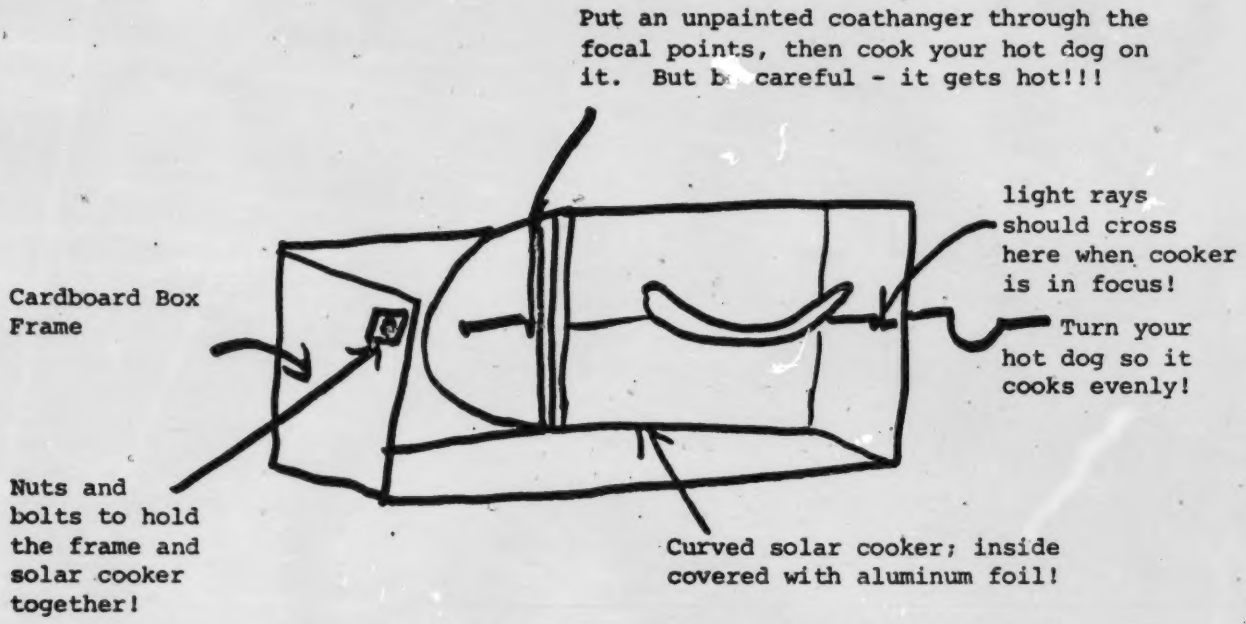


Tape another piece of cardboard to the two half circles you glued together - the width of a piece of cardboard should be slightly less than the width of the box you cut to make a frame!

Cover all of inside with aluminum foil!

Then, cover the inside of this piece with aluminum foil - use rubber cement!

Then: Adjust the cooker so that you can see the sun's rays across on the focal points. How long does it take to cook a hot dog?


Put an unpainted coathanger through the focal points, then cook your hot dog on it. But be careful - it gets hot!!!
light rays should cross here when cooker is in focus!
Turn your hot dog so it cooks evenly!
Cardboard Box Frame
Nuts and bolts to hold the frame and solar cooker together!
Curved solar cooker; inside covered with aluminum foil!

OBJECTIVE: To realize how our lives will be affected and in what ways it will change when electricity is cut back to a minimal use.

ACTIVITIES: Do not use any form of electricity in the classroom the first part of the day. Have a class discussion as to ways it affected us. Think about the ways electricity is used at school and what would happen without it. Assign Creative Writing: "What my life would be like without electricity?" Reading: Make a collage of pictures cut out from magazines of people, appliances, etc., using electricity. Then, make another chart of alternative ways of getting tasks completed without any electricity. Art: Draw a picture of a student doing something with electricity and then a picture of ways to accomplish the task without electricity.

OBJECTIVE: Energy can be conserved by everyone. To get students to figure out ways to conserve energy daily.

ACTIVITIES:

1. Each student keeps a record one day of all the ways he/she used energy that day at home, in school, trips, etc.
2. Next day make a class chart of all the ways students used energy for that day. Try to figure out who used the most energy. Discuss ways they could conserve.

Creative Writing: "I can save energy in my daily life by....."

Illustrate their writing by drawing one or more ways to save energy.

Role Play: Students take roles which involve wasting energy; then, after discussion of ways to conserve, they take same roles only showing ways to conserve this energy.

OBJECTIVE: Electrical energy can light a light bulb.

MATERIALS: Flashlight bulb, D cell battery, copper wire, masking tape.

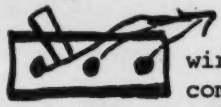
ACTIVITY: Give each group the materials listed above. Tell them they must light the light bulb. See which group succeeds first, second, etc. Discuss the electrical current that is flowing from the battery through the wires.

OBJECTIVE: A circuit has to be closed for electricity fo flow.

MATERIALS: Switch, copper wire, screw driver, all materials in Example A.

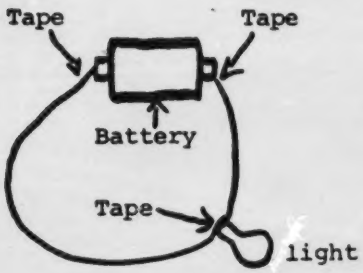
ACTIVITY: Let each group try to turn the light on and off using the switch. Talk about the current being able to flow when the circuit is closed. What is happening when you move the switch? Does this happen in your light switch in your house?

* Screws in switch must be tight over wires.
* Wire other than copper may work.

** In this type switch 

wires must be screwed into two adjacent screws to complete circuit. Let students experiment changing wires. (When is the circuit closed? When is there a break?)

A.



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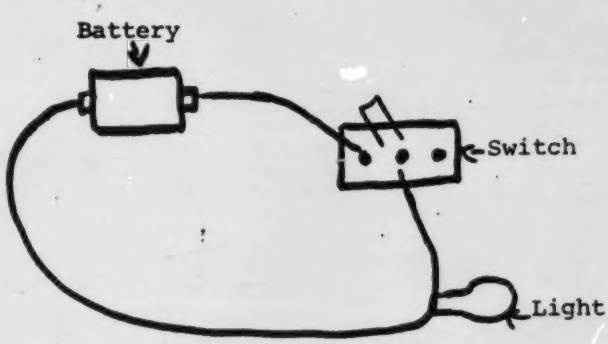
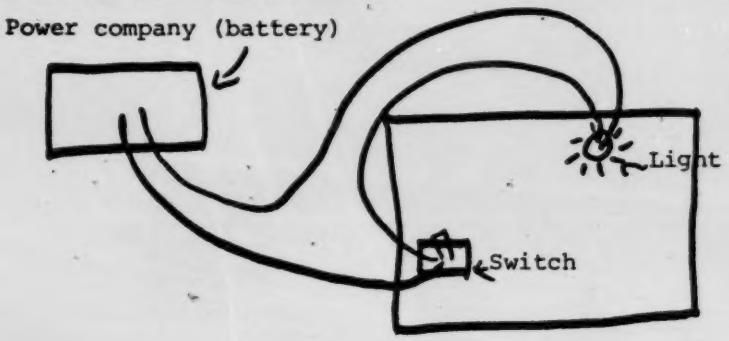


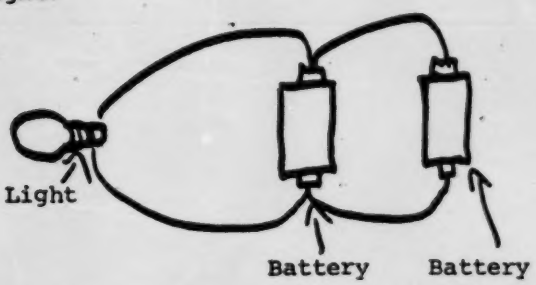
OBJECTIVE: Electrical Energy lights our homes.

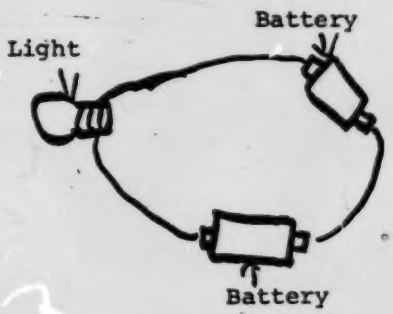
ACTIVITY: Students should try and draw a diagram showing how the light in a room is lighted. What is the battery? Student's drawings may look something like this:



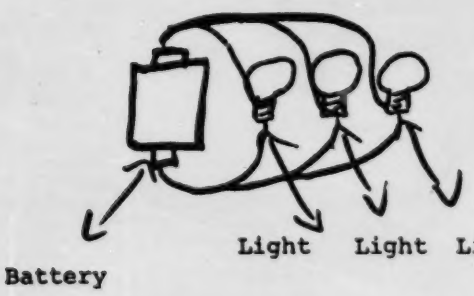
OBJECTIVE: There are two types of circuits: series and parallel.

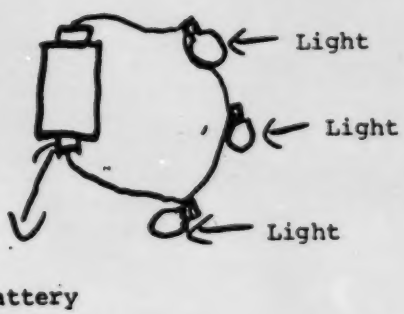
ACTIVITY: First, let students experiment with one light and two batteries. Do two batteries make the light twice as bright? What are two ways to hook up the batteries, using three wires, then four wires? What happens when you remove a wire? Will it always turn off the light?





Second, let students experiment with three lights and one battery. What happens when you remove a light? Talk about strings of Christmas tree lights; some are parallel while others are series.





OBJECTIVE: Different Kinds and sizes of bulbs give off different amounts of light and lost heat energy.

ACTIVITY:

1. Use different watt bulbs in a lamp. Compare the amount of light and also heat. Students can feel the heat with their hands above the bulb. Make sure children understand that a higher watt bulb is using more electricity. Tell them to have their parents check the wattage on lights at home. Do you have more light than you need? How could you save energy?

2. Turn off lights in room and cover windows. Use a 15 watt flourescent bulb and a 15 watt incandescent bulb in a lamp. Which produces more light? Which is hotter? Which uses more electricity? (They use the same since they are both 15 watts.) Let students list places they could use flouresscent lighting at home.

3. Open windows and let in sunlight. How much light do we now have? How much electricity did we use? Why can't we use sunlight instead of electric lights? (Sun doesn't shine at night. Room doesn't have enough windows.)

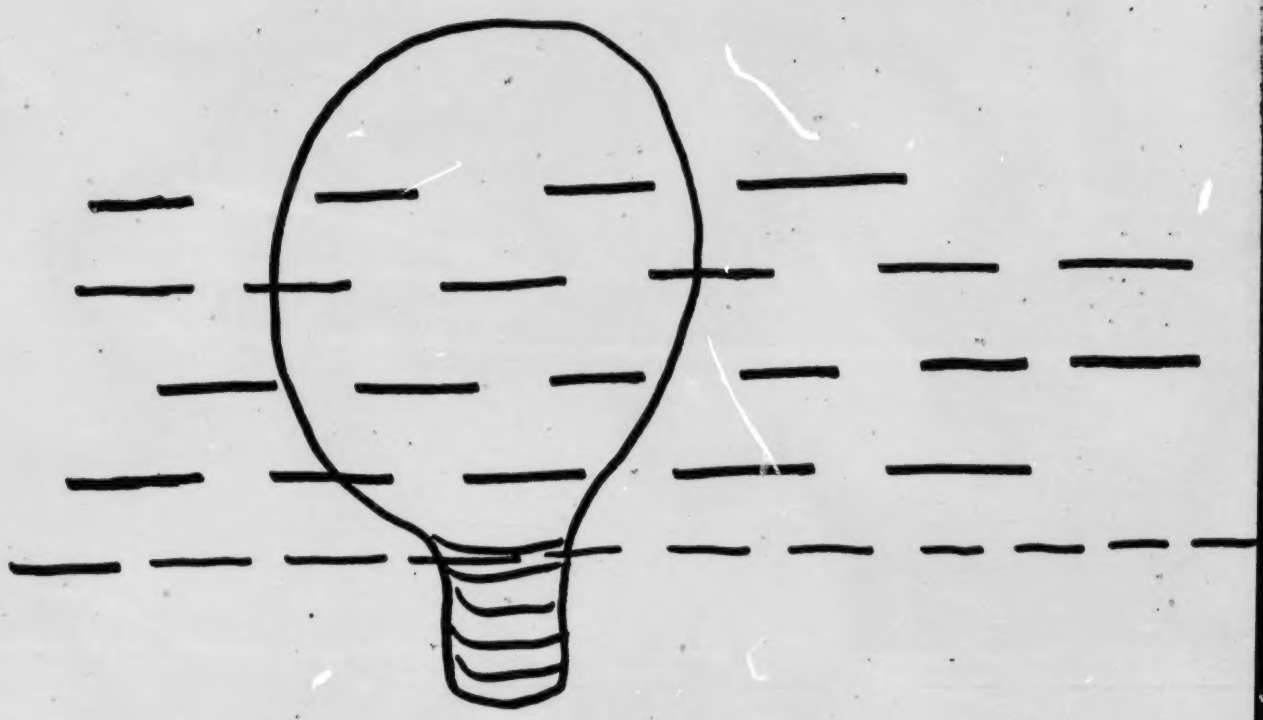
OBJECTIVE: Making electricity costs money.

MATERIALS: AA battery (1½ v), light, wires, C or D cell battery.

ACTIVITY: Leave a battery on and see how long it lasts burning a light. Why doesn't it work anymore? Does it cost money to buy another battery to burn the light? If you have lights burning at home, are you using up energy? Do your parents have to pay for this energy? Why?

Compare different batteries (AA, C, or D Cell). Which burns the light longer. How big a battery would you need to light all the lights in your house? What can we do with the battery now? Throw it away? Recycle it?

WORD PUZZLE



1. AN ELECTRICAL CURRENT TRAVELED THROUGH THE WIRES FROM THE BATTERY TO THE LIGHT ____.
2. WE CAN TURN OUR LIGHT ON AND OFF WITH THE _____.
3. WE TURN LIGHTS OFF TO SAVE _____.
4. ELECTRICITY IS DANGEROUS; IT CAN _____ YOU.
5. OUR BATTERY MADE _____.

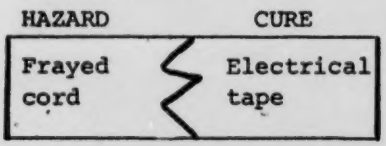
ANSWERS: 1. BULB
2. SWITCH
3. ENERGY
4. SHOCK
5. ELECTRICITY

OBJECTIVE: Have children be aware of the importance of electrical safety.

MATERIALS: Set of puzzle cards. One piece with an electrical hazard and the piece that would fit would provide the cure for the electrical hazard.

ACTIVITY: Divide the room into two groups. Give one group the hazard cards and the other group the cure cards. When signal is given, allow children 30 seconds to match up hazard with cure. They will know if they are correct when their cards fit together. After 30 seconds, call time. Children who are not matched are "Zapped", or lost that round. Collect cards - re-shuffle. Start over.

*Examples of cards:



Hazard	Cure
1. Frayed cord	1. Electrical tape
2. Plugged in lamp without bulb	2. Light bulb

A discussion should come from this activity. Sample questions:

1. Why is a frayed cord dangerous?
2. Why is it dangerous to use an electrical applicance (such as blow dryer) when standing in water?

OBJECTIVE: Conservation of a fossil fuel. Given a community of people, the child will be able to group some of the people to conserve petroleum they use in daily transportation.

MATERIALS: Map A - pencil, map, question sheet.
Map B - pencil, map, question sheet, fact sheet.

Directions for Map A or B: Use the following questions or some of your own. This activity works best when done orally. Map A is simpler than Map B.

Conclusions:

1. Car pooling helps conserve petroleum.
2. Those who can use alternate methods of transportation (walk, ride bike, etc.) to work should do so.
3. Generally, the closer one lives to work or school, the less petroleum is needed for transportation.

QUESTION SHEET FOR MAP A

Conservation of Petroleum

1. Who could walk to work by crossing one street? (minister, librarian, carpenter, grocery checker)

2. If the teachers, secretary, and children could all ride together, how many could go to school in one vehicle? (13)

3. Who travels farther to work --

   A. the doctor or the minister? (doctor)
   B. the policeman or the librarian? (policeman)
   C. the lawyer or a teacher? (teacher)

4. Who would use more gas traveling to work --

   A. the doctor or the minister? (doctor)
   B. the policeman or the librarian? (policeman)
   C. the lawyer or a teacher? (teacher)

5. Whose work does not allow for car pooling? (truck driver, policeman, minister when he makes visitations)

6. How many children could easily walk to the park? (2 boys)

7. Who lives closest to the grocery store -- the carpenter or the truck driver? (truck driver)

8. Who would use the least amount of gas to get to the grocery store from his house -- the carpenter or the truck driver? (truck driver)

9. How many people live one or two blocks from work? (6) (minister, librarian, carpenter, grocery checker, lawyer, policeman)

10. How many people live more than two blocks from work? (6) (citrus plant manager, teachers, secretary, doctor, truck driver)

NORTH

MAP A

New Buildings	Policeman, Teacher, boy and girl	Lawyer, Doctor,	Citrus Plant Mgr., Teacher, boy and girl
New Buildings	Carpenter School Secretary girl	Minister Librarian 2 girls	Church
Citrus Plant	Police Station	Library	Law Offices Post Office
Gas Station Fire Station	Fashion Shop	Grocery Store	Flower Shop Drug Store
Park	School	Grocery Checker Truck Driver 2 boys	Hospital

WEST

EAST

SOUTH

QUESTION SHEET FOR MAP B

Conservation of Petroleum

1. Who could walk to work by crossing one street? (Mr. Thomas, Mrs. Thomas, Mr. Porter, Mrs. Gray)

2. Mrs. Smith takes her children and the Thomas children to school with her. How many ride together? (6) (Mrs. Smith, Bill, Gail, Jerry, Mark, Sarah)

3. Who travels farther to work -- a) Mr. Thomas or Mrs. Jones? (Mrs. Jones) b) Mr. Smith or Mr. Porter? (Mr. Smith)

4. Who would use more gasoline to get to work -- a) Mr. Thomas or Mrs. Jones? (Mrs. Jones) b) Mr. Smith or Mr. Porter? (Mr. Smith)

5. Mrs. Camp takes her children and the Jones children to school with her. How many ride together? (4) (Mrs. Camp, Karen, Paul, Joey)

6. Whose work does not allow for car pooling? (Mr. Gray - deliveries, Mr. Thomas - visitation, Mr. Camp - policemen)

7. If they all could ride together, how many people could go to school in one vehicle? (13)

NORTH

MAP B

New Construction	Camp Family	Jones Family	Smith Family
New Construction	Porter Family	Thomas Family	Church
Citrus Processing Plant	Police Station	Library	Law Office Post Office
Fire Station Gas Station	Fashion Shop	Grocery Store	Flower Shop Drug Store
Park	School	Gray Family	Hospital

WEST

EAST

SOUTH

41

FACT SHEET - MAP B

Conservation of Petroleum

1. Mr. Jones is a lawyer.
   Mrs. Jones is a doctor.
   Joey is their son.

2. Mr. Smith works at the citrus plant.
   Mrs. Smith is a teacher.
   Bill is their son.
   Gail is their daughter.

3. Mr. Camp is a policeman.
   Mrs. Camp is a teacher.
   Karen is their daughter.
   Paul is their son.

4. Mr. Thomas is a minister.
   Mrs. Thomas is a librarian.
   Sarah is their daughter.
   Jerry and Mark are their sons.

5. Mr. Porter is a carpenter.
   Mrs. Porter is a school secretary.
   Donna is their daughter.

6. Mr. Gray delivers dairy products to nearby towns.
   Mrs. Gray works at the grocery store.
   Kay is their daughter.
   Grandmother Gray works at the flower shop.

ENERGY ACTIVITIES FOR
STUDENTS IN GRADES
FIVE AND SIX.....

CROSSWORD PUZZLE

CLUES

ACROSS:

1. You need ____ to give your body energy.
5. ____ gas can be pumped to your home for heating and cooking.
6. Fuel for automobiles.
8. The first successful ____ well was drilled in the United States in 1859.
10. The thick liquid that is pumped from underground pools is called ____ oil.
11. Nuclear energy is energy released when an ____ is split apart.

DOWN:

1. Coal, natural gas, and oil are called ____ fuels.
2. ____ is the power to make things move.
3. The Europeans were the first to mine ____ for heating.
4. In a steam engine, coal is burned to heat ____.
7. Energy from the sun.
9. When water boils, ____ is released to work for us.

ACROSS
1. Food
5. Natural
6. Gasoline
8. Oil
10. Crude
11. Atom

DOWN
1. Fossil
2. Energy
3. Coal
4. Water
7. Solar
9. Steam

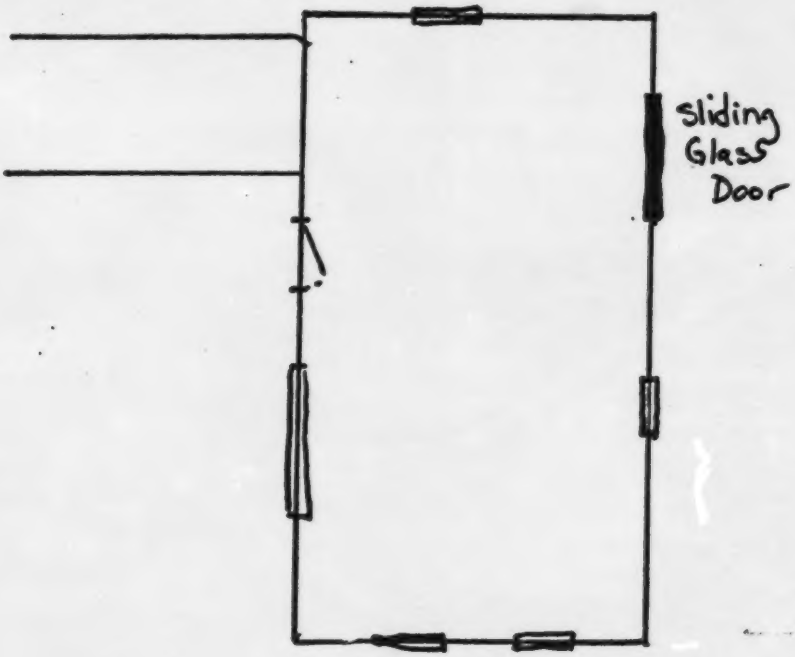
Deciduous TREE

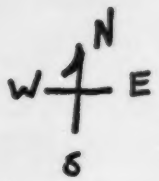
Deciduous Shrub

Evergreen Shrub

Evergreen Tree

Note: Leave ample space





Glass door

door

window

OBJECTIVE: The students understand the energy saving capabilities of landscaping.

ACTIVITY: Design an activity sheet with a floor plan diagram of a typical home. Allow students to plant (draw) four different types of trees (evergreen trees, evergreen shrubs, deciduous trees and shrubs). They may plant any number of the different kinds of trees. Lead a discussion of the characteristics of the different types of trees. Use symbols to indicate the plants on the activity sheet. (See Activity Sheet diagram.)

Have students explain why they placed trees in a particular location. Point out good points in all ideas and illustrate the best of each on the chalkboard to create an "ideal" layout.

BACKGROUND INFORMATION FOR TEACHERS

Basic energy saving landscape should include:

1. Evergreen trees on the north and west impede cool winter breezes;
2. Deciduous trees on the south provide summer shade but lose their leaves in the winter to allow the sun to reach the house;
3. Shrubs close to a house provide a dead air space that holds in heat in winter and cools in summer.

ADDITIONAL ACTIVITIES: Contact local forest service to (1) lecture; (2) plant trees at school.

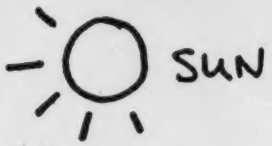
OBJECTIVE: The students will discover the heat storage capabilities of rocks.

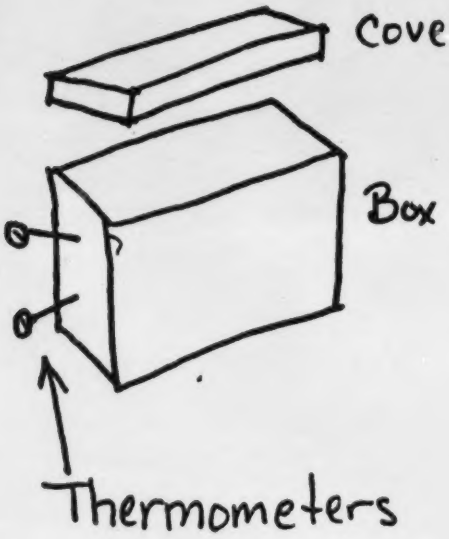
Can you carry the sun's heat inside?

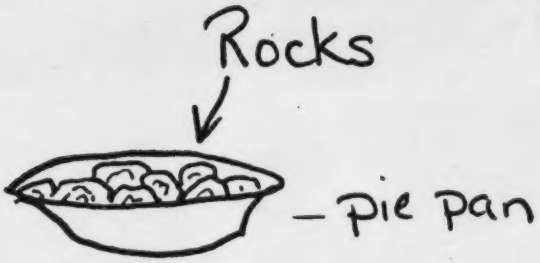
MATERIALS: Pie pan, rocks, thermometers, cardboard box with cover (slightly larger than pie pan)

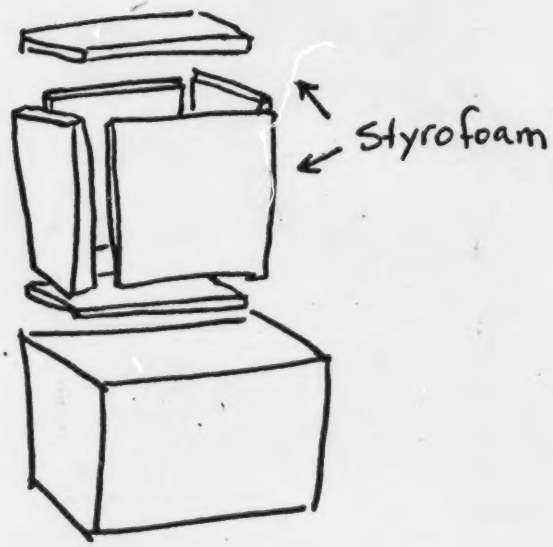
ACTIVITY:
1. Place rocks in pie pan and place in the sun for a pre-determined time. (15 minute minimum suggested)
2. Place pan with rocks inside the cardboard box and cover. Place thermometer in small hole in side of box.
3. After 3 minutes, compare the temperature of the air in the box with the temperature of the air in the room.
4. Complete the chart below.

Can you carry the Sun's heat inside?







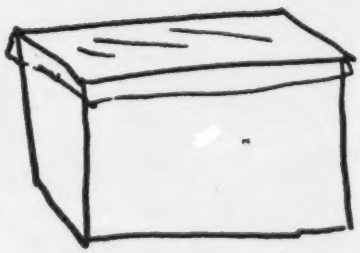


VARIATIONS

Paint rocks and/or Pie pan black

Insulate box

insulate pan



cover box with plastic wrap.

3 Min.	6 Min.	9 Min.	12 Min.	
				Room Temperature
				House Temperature (constant)

VARIATIONS:

1. Would it affect the temperature if we painted the rocks or the pie pan black? Other colors?
2. What happens if we increase the number of rocks?
3. Increase the time in the sun.
4. Is temperature affected by different insulations? (paper, styrofoam, fiberglass, etc.)
5. Use plastic wrap to cover box, and leave out in sun with the rocks in it. Bring indoors and cover.

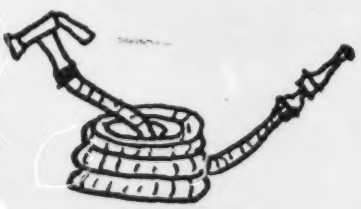
OBJECTIVE: The students will discover how to design a simple solar collector.

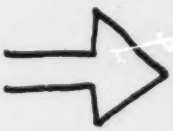
Is a water hose a solar collector?

MATERIALS: Small garden hose, two nozzles (one for each end), thermometer, water, container

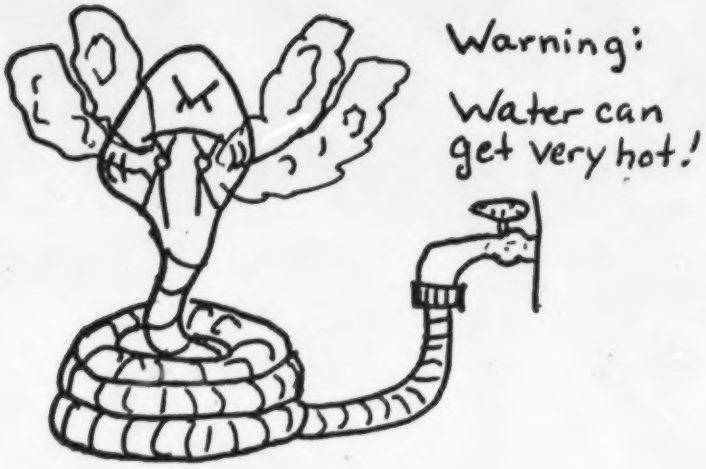
Take temperature of water.

Fill hose with water and close ends.





Place hose in the sun for a predetermined time.



Place small amount of water from the hose in a container and take the temperature.

Other ideas to explore:

Use different colored backgrounds for the water hose.

Use different lengths of hose.

Coil hose, stretch it out, and try other configurations.

Hang hose in the air; compare temperature with that when putting it on the ground.

Place hose in boxes--white and black.

Cover the box with glass or plastic wrap.

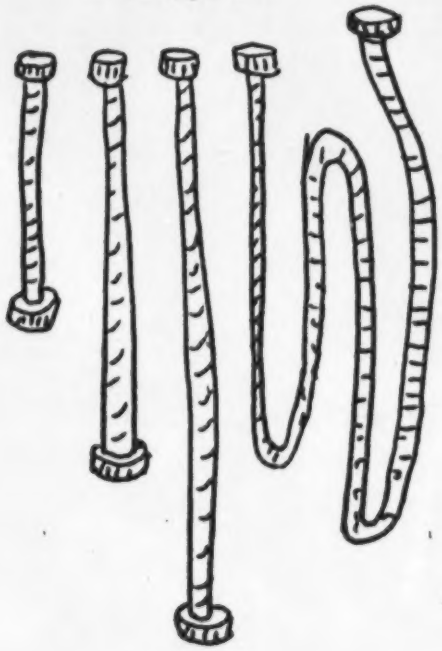
Place hose on different surfaces--asphalt, grass, sand, dirt, etc.

OBJECTIVE: To help the children become aware of the various opinions of different interests in the process of moving oil from ground to consumers.

ACTIVITY:

1. Lead class discussion to determine the four major groups affect-oil usage (owners, distributors, government, consumer).
2. Come up with group identities. Example, Arabs, Exxon, U. S. Dept. of Energy, John Q. Public.
3. Divide class into the four groups to discuss the suggested questions.
4. Provide ample time for group discussion and/or research.

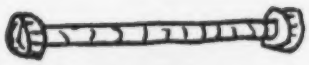
Use different lengths of hose



Try various configurations

coiled

streched

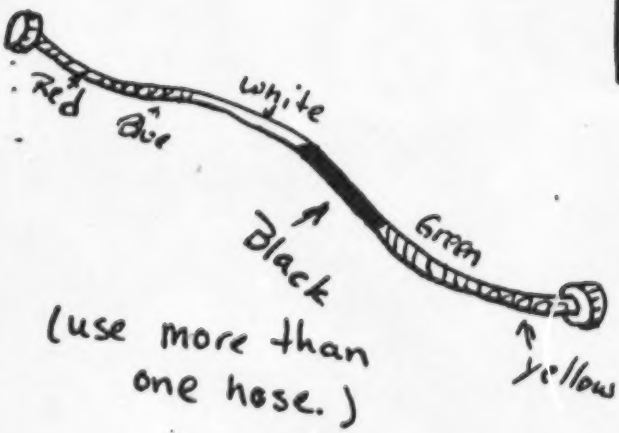


Other placements

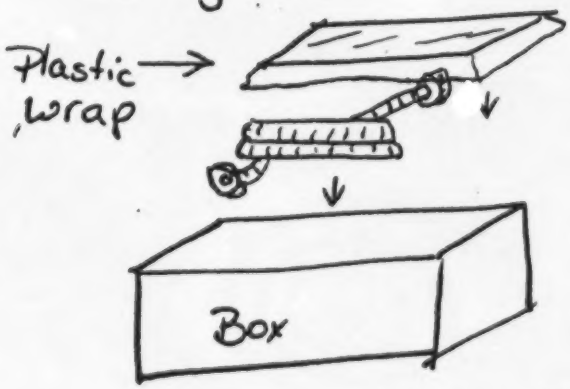
on ground

in air

different color hoses.



(use more than one hose.)



in a plastic covered box.

5. Each group presents possible answers and conclusions to the class. Questions that arise during presentation should be written down to discuss (1) at the end of each group presentation; or (2) at the end of the total presentations.

1. Questions for owners.

   a. How much do you charge?

   b. How much do you think the users will want?

   c. How do you determine who gets what amount of oil?

   d. How much do you want to produce?

   e. How much do you have left in supply?

2. Questions for distributors?

   a. How much profit do you want?

   b. What will the profit be used for?

   c. How much oil do you want to hold back (stockpile) from the users?

   d. What kind of products are made from the crude oil?

   e. List the products you can make from the oil you receive?

3. Questions for government.

   a. Do you want to limit profits of oil companies?

   b. How much do you want to tax the oil?

   c. What can the government do to encourage the conservation of oil?

   d. What should the government do if our oil supply is cut off?

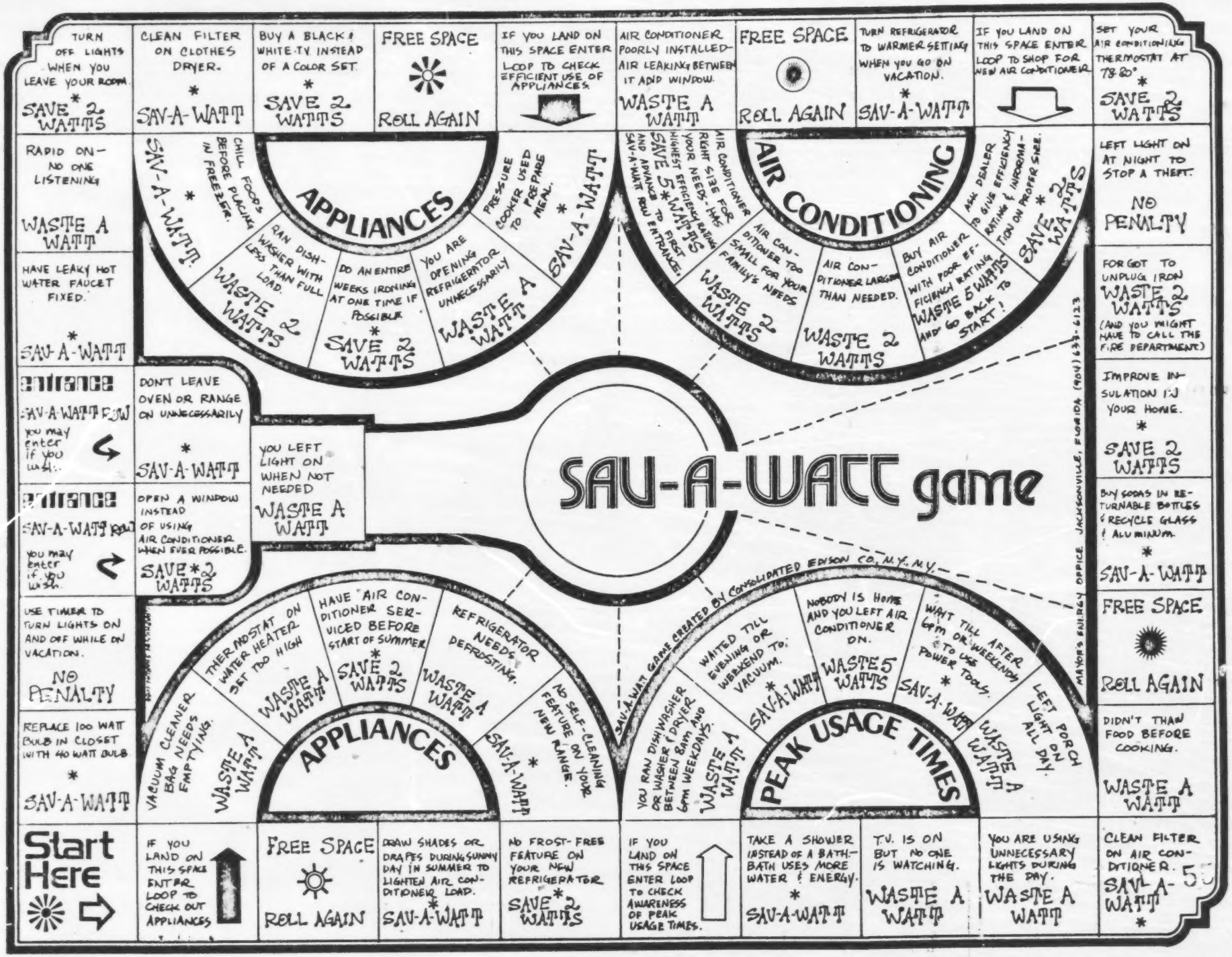
4. Questions for consumers to ask themselves.

   a. Why should I conserve?

   b. Do I think there is a shortage?

   c. What do we think of the other groups, i.e., government, distributors, owners?

FOLLOW-UP ACTIVITIES: Rotate groups to better show other points of view.


SAV-A-WATT game
APPLIANCES
AIR CONDITIONING
PEAK USAGE TIMES
APPLIANCES
Start Here
TURN OFF LIGHTS WHEN YOU LEAVE YOUR ROOM. * SAVE 2 WATTS
CLEAN FILTER ON CLOTHES DRYER. * SAV-A-WATT
BUY A BLACK & WHITE TV INSTEAD OF A COLOR SET. * SAVE 2 WATTS
FREE SPACE ROLL AGAIN
IF YOU LAND ON THIS SPACE ENTER LOOP TO CHECK EFFICIENT USE OF APPLIANCES
AIR CONDITIONER POORLY INSTALLED-AIR LEAKING BETWEEN IT AND WINDOW. WASTE A WATT
FREE SPACE ROLL AGAIN
TURN REFRIGERATOR TO WARMER SETTING WHEN YOU GO ON VACATION. * SAV-A-WATT
IF YOU LAND ON THIS SPACE ENTER LOOP TO SHOP FOR NEW AIR CONDITIONER
SET YOUR AIR CONDITIONING THERMOSTAT AT 78-80° * SAVE 2 WATTS
RAPID ON-NO ONE LISTENING WASTE A WATT
HAVE LEAKY HOT WATER FAUCET FIXED. * SAV-A-WATT
entrance SAV-A-WATT ROW you may enter if you wish.
DON'T LEAVE OVEN OR RANGE ON UNNECESSARILY * SAV-A-WATT
YOU LEFT LIGHT ON WHEN NOT NEEDED WASTE A WATT
entrance SAV-A-WATT ROW you may enter if you wish.
OPEN A WINDOW INSTEAD OF USING AIR CONDITIONER WHEN EVER POSSIBLE. SAVE * 2 WATTS
USE TIMER TO TURN LIGHTS ON AND OFF WHILE ON VACATION. NO PENALTY
REPLACE 100 WATT BULB IN CLOSET WITH 40 WATT BULB * SAV-A-WATT
IF YOU LAND ON THIS SPACE ENTER LOOP TO CHECK OUT APPLIANCES
FREE SPACE ROLL AGAIN
DRAW SHADES OR DRAPES DURING SUNNY DAY IN SUMMER TO LIGHTEN AIR CONDITIONER LOAD. * SAV-A-WATT
NO FROST-FREE FEATURE ON YOUR NEW REFRIGERATOR * SAVE 2 WATTS
IF YOU LAND ON THIS SPACE ENTER LOOP TO CHECK AWARENESS OF PEAK USAGE TIMES.
TAKE A SHOWER INSTEAD OF A BATH-BATH USES MORE WATER & ENERGY. * SAV-A-WATT
T.V. IS ON BUT NO ONE IS WATCHING. WASTE A WATT
YOU ARE USING UNNECESSARY LIGHTS DURING THE DAY. WASTE A WATT
CLEAN FILTER ON AIR CONDITIONER. SAVE A WATT *
LEFT LIGHT ON AT NIGHT TO STOP A THEFT. NO PENALTY
FORGOT TO UNPLUG IRON WASTE 2 WATTS (AND YOU MIGHT HAVE TO CALL THE FIRE DEPARTMENT)
IMPROVE INSULATION IN YOUR HOME. * SAVE 2 WATTS
BUY SODAS IN RETURNABLE BOTTLES & RECYCLE GLASS & ALUMINUM. * SAV-A-WATT
FREE SPACE ROLL AGAIN
DIDN'T THAW FOOD BEFORE COOKING. WASTE A WATT
CHILL FOODS BEFORE PUTTING IN FREEZER. SAV-A-WATT *
RAN DISH-WASHER WITH LESS THAN FULL LOAD. WASTE 2 WATTS
DO AN ENTIRE WEEKS IRONING AT ONE TIME IF POSSIBLE. * SAVE 2 WATTS
YOU ARE OPENING REFRIGERATOR UNNECESSARILY WASTE A WATT
PRESSURE COOKER USED TO PREPARE MEAL. * SAV-A-WATT
AIR CONDITIONER HIGHEST EFFICIENCY RATING AND ADVANCE TO FIRST SAV-A-WATT ROW ENTRANCE! SAVE 5 * WATTS
AIR CONDITIONER RIGHT SIZE FOR YOUR NEEDS-HAS YOUR NEEDS-HAS
AIR CONDITIONER TOO SMALL FOR YOUR FAMILY'S NEEDS WASTE 2 WATTS
AIR CONDITIONER LARGER THAN NEEDED. WASTE 2 WATTS
BUY AIR CONDITIONER WITH POOR EFFICIENCY RATING WASTE 5 WATTS AND GO BACK TO START!
ASK DEALER TO GIVE EFFICIENCY RATING & INFORMATION ON PROPER SIZE. * SAVE 2 WATTS
THERMOSTAT ON WATER HEATER SET TOO HIGH WASTE A WATT
HAVE AIR CONDITIONER SERVICED BEFORE START OF SUMMER * SAVE 2 WATTS
REFRIGERATOR NEEDS DEFROSTING. WASTE A WATT
NO SELF-CLEANING FEATURE ON YOUR NEW RANGE. * SAV-A-WATT
VACUUM CLEANER BAG NEEDS EMPTYING. WASTE A WATT
SAV-A-WATT GAME CREATED BY CONSOLIDATED EDISON CO. N.Y. N.Y.
MAYER'S ENTIRELY OFFICE JACKSONVILLE, FLORIDA (904) 633-6123
YOU RAN DISHWASHER OR WASHER & DRYER BETWEEN 8am AND 6pm WEEKDAYS. WASTE A WATT
WAITED TILL EVENING OR WEEKEND TO VACUUM. * SAV-A-WATT
NOBODY IS HOME AND YOU LEFT AIR CONDITIONER ON. WASTE 5 WATTS
WAIT TILL AFTER 6pm OR WEEKENDS TO USE POWER TOOLS. * SAV-A-WATT
LEFT PORCH LIGHT ON ALL DAY. WASTE A WATT

SAVE A WATT GAME

Before playing, cut 64 one-watt squares from construction paper, 16 five-watt squares and 40 two-watt squares. Make each player from multi-colored paper and obtain one dice.

Rules:

2-10 people can play. Each player begins with 15 watts. One five-watt square; 3 two-watt squares, and 4 one-watt squares.

Designate one player to serve as the utility company (like banker in monopoly). He will take surplus watts keeping them separated from his own and give or take them from the other players as the game progresses.

To Win:

A player wins if he reaches the big bulb and has fewer watts than any other player or he wins if he gets rid of all his watts at any stage of the game in which case he need not reach the bulb.

To Play:

All players roll the dice once, the player rolling the highest number starts. If there is a tie the tied players roll again, highest going first.

The starting player rolls the dice moving his marker the same number of squares on the board. Other players follow in clock-wise order.

If player lands on space instructing him to Save a Watt, he returns a one-watt square to Utility. If instructed to Save two Watts, he returns to a two-watt or 2 one-watt and so on.

If player lands on a Waste Watt space, he must take a one-watt square from Utility. On Waste two-watts or Waste five-watts space, he must take an equivalent number of watts. If player lands on a free space he may immediately roll dice and move marker again. Players landing on No Penalty spaces neither take nor give back watts. If player lands on entrance to a loop, he must enter.

There are two entrances to Save A Watt row which leads to big light bulb. Player landing on either entrance may move towards bulb on his next turn if he wishes. But he can only win the game if he has the least number of watts when he reaches the bulb, so it may not always be wise to enter. If the number rolled takes the player past the Save A Watt entrances, he must continue around the board again. If a player has been around the board twice or more without landing on a Save A Watt entry square, he may, if he chooses, stop on one without an exact roll. Players do not have to reveal the number of watts they are holding until one player reaches the bulb, then it is time to "read your meter." All players must then announce their total number of watts.

Player must land on the bulb by an exact roll. If he is near the end and rolls a number greater than the number of remaining spaces, he may not move his marker. If a player reaches the bulb but does not have the least number of watts, he must take 5 watts from Utility and return to start. The game continues until a player reaches the bulb and at the same time has fewer watts than any other player or until a player gets rid of all his watts.

TEACHER IDEAS FOR USING PHOTOVOLTAIC/SOLAR FANS WITH ELEMENTARY SCHOOL STUDENTS.

These activities were designed for use with solar cubes/fans and small photovoltaic cells which can be connected and disconnected to the solar fans. These materials are available from any scientific/educational supply firm (e.g., Hubbard Scientific) or from commercial electronic firms (e.g., Radio Shack).

ENTRY ABILITY: Students should be able to state several forms of energy: food, natural gas, coal, electricity, gasoline, solar, etc. They should know ways in which the sun's energy is used to grow plants.

ACTIVITY: 1. Show students pictures of household and school items and ask them what kind of energy each one uses: stove, water heater, car, school bus, tree outside a classroom, TV, radio, freezer, light bulb, school air conditioner, pencil sharpener, jump rope, etc.

List the items and the energy type on the chalkboard. Then take students outside (in the sun light) with the solar fan. Ask them to observe it as it is exposed to sunlight. Let them draw conclusions regarding what makes the fan work. Can they increase the amount of work done by the fan? Can they decrease its work?

ACTIVITY: 2. The more direct sunlight, the greater the output of work by the solar fan. Continue to let the students experiment in the sunlight with the solar fan.

a. What happens as the cells are held perpendicular to the sun's rays?

b. What happens as you tilt the cells away from the sun's rays?

c. Cover some of the cells with your hand while holding the cells perpendicular to the sun's rays. What happens? Why?

d. Return to the classroom and use other sources of light: incandescent bulbs, flourescent lighting, etc. Do they make the fan turn? Why? Why not?

e. Summary the students' conclusions on the chalkboard.

ACTIVITY: 3. Add additional solar cells to the solar fan by attaching wires to the motor leads. Reverse the wires to the motor leads. Reverse the wires, and see the fan reverse direction?

Have students explain the additional speed (power) and the reversal of direction.

Use various colors of glass or plastic or cellophane to shade the solar cells. What impact do they make upon the solar fan's work? Any difference by color of material? Any differences by the type of material (plastic, glass, etc.)?